An Overview of NCRP Report No. 138 on Terrorist Activities

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Abstract

In late 1998, the National Council on Radiation Protection and Measurements (NCRP) convened Scientific Committee 46-14 to prepare a report on the radiological safety aspects of terrorist activities involving radioactivity. The work of this committee was funded through a contract with the Planning and Preparedness Division of the Office of Emergency Management of the Department of Energy. The committee was composed of a diverse group of individuals with expertise in many areas in addition to radiation safety and emergency response. These areas included law (both federal and state), public communications, and psychosocial aspects of such incidents. The statement of work focused the work of the committee, and the resulting report did not necessarily address all issues of such activities. One of the charges of the committee was to provide guidance as to necessary research and make recommendations regarding the present infrastructure with the responsibility for responding to such incidents. This presentation will provide an overview of NCRP Report No. 138 and focus on some of the critical issues raised in the report. These issues include recognition of the event, the interface between federal, state, and local authorities, exposure limits for the first-responders, clean-up criteria, training and resources, the psychosocial aspects of such events, and communications with the media and the public. This report represents the "beginning" of such considerations. It points the way for additional studies and research in this very important area.

Introduction

In late 1998, the National Council on Radiation Protection and Measurements (NCRP) convened Scientific Committee 46-14 to prepare a report on the radiological safety aspects of terrorist activities involving radioactive materials. The work of this committee was funded through a contract with the Planning and Preparedness Division of the Office of Emergency Management of the Department of Energy (DOE). A draft of the report was delivered to DOE on 1 September 2000 and, after review and approval by the NCRP Main Council, the report was published on 24 October 2001 (NCRP 2001). Even though the work on this report was started three years prior to the terrorist attacks of September 11th, release of this much needed report appeared to be very timely and in response to this tragic event.

The DOE statement of work focused the work of the Scientific Committee, so the resulting report did not necessarily address all issues associated with such terrorist activities. However, one of the main charges of the committee was to provide guidance as to necessary research and make recommendations regarding the present infrastructure with the responsibility for responding to such incidents. This presentation will focus on some of the critical issues raised in the report. These issues include recognition that the event involves radioactive materials, the interface between federal, state, and local authorities responding to the incident, exposure limits for the first-responders, clean-up criteria, training and resources, the psychosocial aspects of such events, and communications with the media and the public. It should be noted the committee raised and discussed a number of issues (some in great detail). However, frequently there was not a clear consensus nor solution and, therefore, the committee could only make suggestions and/or identify the issue as requiring further attention.

NCRP Report No. 138 – General Organization

The Scientific Committee was composed of a diverse group of individuals with expertise in many areas in addition to radiation safety and emergency response. These areas included law (both federal and state), media and public communications, and psychosocial aspects of such incidents. Members of the committee and their affiliations are presented in Table 1. Although there were many areas of expertise represented, five of the eleven members of the committee were professional health physicists.

After some discussion, the committee decided that the target audience for this report should be those individuals who were likely to be first-responders to terrorist incidents involving radioactive materials and those with responsibilities for emergency planning

and response (local, state, tribal and federal agencies). In addition, the goal was to include sufficient information such that the report would be useful to personnel working in hospital emergency rooms and primary care situations, and specialists in radiation protection who perhaps had not addressed such issues. Because of the complexity of international relations, the report focused only on terrorist incidents in the continental United States.

The report was organized into four basics sections; 1) definition of the problem; 2) management of the disaster; 3) preparation for a major radiological incident; and 4) research and development needs. In defining the problem, the committee included considerations impacting response to the incident, a brief discussion of the characteristics and consequences of terrorist incidents, medical management of radiation casualties, and psychosocial aspects of a radiological incident. The committee became acutely aware of the potential, long-term and wide-spread psychosocial impacts of such an incident. As scientists and engineers, many of us had always approached such incidents "matter of factly," focusing primarily on the technical and scientific aspects of our response. The extensive chapter on psychosocial impact is a "must read" for all individuals involved at all levels of emergency planning and response.

The sections on the management of the disaster section included a discussion of the "knotty problem" of command and control on these incidents, an extensive discussion on public communication and information management, and guidance on dose limitations, decontamination, and cleanup criteria. Some of these issues may not have a straight

forward solution (e.g., command and control), but recognition of the potential problems and open and frequent communication among the participating agencies will go a long way in helping alleviate the consequences that could arise from these issues. The section on command and control was supported by the inclusion of an appendix covering the current command and control policies and structures in the federal government. The communications section included three appendices addressing the current federal communications policy and plans, a sample joint information center checklist, and sample pre-prepared public information statements. Lastly, we included a chapter on radiological consequence management considerations.

The sections related to preparation for a major radiological incident included a discussion of planning for the incident and the critical resources needed for a proper response, training and qualifications for personnel providing support in a radiological disaster, and a summary of research and developments needs to address important areas identified by the committee. Also included were three appendices covering the federal and state resources for emergency response and planning assistance, examples of tables of contents for a city plan for emergency response, and information on training under the Domestic Preparedness Program.

Main Issues and Suggested Solutions

a. Recognition of the event

Perhaps the major problem faced by first-responders to a radiological incident is that of recognition. That is, how do the first-responders recognize that this is a radiological

incident as opposed to some other, more usual emergency occurrence? The simple answer if that personnel and/or vehicles likely to respond to an emergency should carry radiation detectors. These detectors could take many forms from portable survey instruments to the more modern, electronic alarming dosimeters. After much discussion, the committee concluded that a very simple device mounted in the emergency response vehicle might be the best solution. Mounting the device in the vehicle ensured that it was always available and was not left behind in the rush to respond to the incident. In addition, by mounting it in the vehicle there was some assurance that the device would always have the necessary electric power and that it was in working order. The device could be a simple, rugged detector with very simple circuitry, and three, colored lights mounted on the dashboard of the vehicle. In addition, the detector/alarm system would simple so that it would be easy to maintain and calibrate and could be the responsibility of emergency response personnel (i.e., the system would not require extraordinary expertise to maintain and calibrate).

Conceptually, a green light would indicate no radiation present, a yellow light would indicate a radiation dose rate above normal background and a red light would indicate a relatively high radiation dose rate and/or an ambient level. The alarm point for the yellow light was chosen to be 0.1 mSv/h (10 mrem/h). It was concluded that this level was sufficient to eliminate false alarms because it was well above natural background levels but the dose rate was still not immediately hazardous. In addition, this dose rate was taken as the appropriate location to establish an initial control point. The red light would illuminate if the dose rate reached 0.1 Sv/h (10 rem/h) or the ambient dose level

reached 0.1 Sv (01 rem). The committee considered this dose rate the "turn around" dose rate, yet they also indicated that this level should still permit the first-responders on the scene to perform time-sensitive, critical missions before withdrawing.

While this simple system would address many of the recognition concerns, the committee recognized that there may be other intentional uses of radioactive materials for which the system would be useless. Thus, there is still a need to address the detection and recognition of terrorist incidents in which large sources may be introduced into public places without alerting police and/or emergency response personnel.

b. Who is in charge?

This is not an insignificant issue when one considers all the agencies that have independent statutory authority to respond to such incidents. These agencies include many local, county, state, tribal, and federal agencies. As the committee reviewed those agencies potentially involved in response to a terrorist activity, it became clear that there will always be conflicts. Perhaps such conflicts are inherent in our federalist system, but the committee did not recommend a complete overhaul of the existing emergency response system in the United States. Further, it became very clear that who is in charge was dependent on the stage of the emergency response. Rather than a transition from crisis management to consequence management, these activities may take place at the same time. The transition from one to the other may not be completely clear and may require a long period time over which they have to be carefully coordinated.

For crisis management, generally the federal government has responsibility and the Federal Bureau of Investigation (FBI) is the lead agency for terrorist acts. For consequence management, the local authorities have responsibility for the public health and safety. But, this agreed upon division of responsibility does not eliminate potential conflicts. For example, there will almost always be a conflict between emergency medical personnel and local authorities, who are responding to the crisis from a humanitarian point of view and have a responsibility for protection of the local citizens, and the FBI, who will treat the incident scene as a "crime scene" first in order to gain a complete understanding of what occurred and to gather evidence for future use.

c. Psychosocial Aspects of Terrorist Incidents

Psychosocial impacts of a terrorist act have not been given proper consideration in many ways. These effects represent a huge problem because they will have a significant impact on the success of the consequence management aspects of the response. Psychosocial impacts are often the problem with the greatest impact on the affected population, are likely to have the longest-lasting adverse health impact, and are likely to be the most difficult health impact to treat. It is also important to note that there will be psychosocial aspects of an event even if there are no health impacts from radiological materials. It is not necessary for a radiological event to occur, but merely threatened, for the psychosocial impacts to be noticeable in the population.

The committee concluded that understanding the problem was the first step toward addressing these impacts. It must be recognized that there were both immediate and

long-term effects. Immediate effects include panic, mistrust, and radiophobia, while long-term effects include post-traumatic stress disorder and the feeling of a "radiation stigma." Threat characteristics must be understood, including the psychological impact of an invisible, poorly understood threat and that the incident represented an intentional act against the general public. In addition, there are likely to be special populations who require careful assistance and counseling. These include pregnant women, women with small children and the children themselves. Depending on the severity of the incident and long-term commitment of emergency/responder personnel to dealing with the incident, these individuals (and their families) may require extensive care after the incident. These individuals often will encounter extraordinary stresses and highly traumatic situations in the line of duty.

While this is an area that clearly requires additional research, the committee made several recommendations to begin to address this problem. These include building public trust and confidence through honesty and fully informing the media and, through them, the public. These aspects must be incorporated into the training at all levels, including the decision-makers. Psychosocial aspects must be incorporated into all training exercises and emergency plans must include plans for long-term care of a segment of the population.

d. How much exposure should be allowed?

The committee approached this question with well-being of both the first-responders and the general public clearly in mind. The committee debated the wisdom of adopting an approach

similar to that taken by the International Commission on Radiological Protection (ICRP) in Publication 63 (ICRP 1993). Here the ICRP took the position that the principle of limitation (i.e., setting dose limits) should not apply and that decisions be made based on applying the principles of justification and optimization. In addition, the ICRP took the position that countermeasures should be based on the concept of "averted dose."

Although both the ICRP and NCRP had addressed issues such as nuclear attack (NCRP 1974) and large scale radiation accidents (ICRP 1984) in reports published years ago, we recognized that never before had either body been confronted with the threat of terrorist activities. In addition, we recognized that, in all considerations of radiation exposure, neither the ICRP nor the NCRP had addressed what truly could be called "dose limits for first-responders" to terrorist activities involving radioactive materials (ICRP 1991, NCRP 1993).

The NCRP addresses "emergency occupational exposure" in its recommendations (NCRP 1993) and this guidance could be extended to first-responders:

> "Exposures during emergency actions that do not involve life-saving should, to the extent possible, be controlled to the occupational dose limits. Where this cannot be accomplished, it is recommended that a limit of 0.5 Sv effective dose and an equivalent dose of 5 Sv to the skin be applied, which is consistent with ICRP recommendations."

Thus, even though first-responders are not usually considered "occupationally-exposed workers," the NCRP recommended dose limits are reasonable for use in these situations. The NCRP recommendation includes additional instructions that:

> "The use of volunteers for exposures during emergency actions is desirable. Older workers with low lifetime accumulated effective doses should be chosen from among the volunteers, whenever possible." (NCRP 1993)

While the recommendations on emergency occupational exposure limits could be applied appropriately to first-responders, the recommendations on selection of participants cannot be applied to the scenarios involving first-responders. These first responders will be on the scene because of their responsibilities to a local authority (e.g., fire, police, medical, etc.) and not because they are trained to respond to nuclear emergencies, volunteered or have a low lifetime accumulated effective dose. Thus, guidance on selection of individuals, while appropriate for later phases of the incident, was not applicable to first-responders.

Exposure of the general population was another consideration in which the writing group felt it was necessary to "think out of the box." Here, there were two considerations; immediate actions to address the population in the vicinity of the incident (e.g., sheltering, evacuation, wide-spread use of radioprotectants, interdiction of foodstuffs, etc.) and the long-term "radiation-exposure management" of the general population. The ICRP (ICRP 1993) has made some specific recommendations in this regard but the NCRP has been silent on this issue.

Even though the ICRP recommended against it, the committee concluded that, if the authorities at all levels within this country were to agree on a unified approach, some sort of numerical limits would be necessary to guide their decisions. Clearly, the 1 mSv annual limit for the general public, recommended by both the ICRP and NCRP, was not necessarily appropriate during such an incident and the 5 mSv limit for "infrequent exposures" also was found lacking

for the same reasons. While the committee was acutely aware of previous recommendations of these bodies, the ICRP recommendations on intervention cited above, and arguments for and against the linear non-threshold hypothesis, we felt that there was not sufficient guidance on which we could make specific recommendations for use in terrorist incidents (especially during the initial phase of the incident). In addition, it was the general consensus that actions taken based on this somewhat arbitrary annual limit for the general public might "do more harm than good" as well as causing an unnecessary drain on available resources. Thus, while we made no specific recommendation in this area, we hoped that NCRP Committee 1 would address the issue and provide some consensus as to more appropriate limits. Once the NCRP had made such recommendations, we hoped that there could be agreement on the recommended limits so that local, county, state and federal agencies could have a unified approach to emergency response.

e. How do you know when you have cleaned up?

This is another "knotty problem" that was discussed but not completely addressed by the committee. Clearly, there are strong technological and economic limitations that must be considered when deciding on appropriate clean-up criteria. The committee felt that the principles of justification, optimization and limitation should be used to develop cleanup plans. In addition, the established public exposure limits did not necessarily represent the appropriate level. We recognized that there may be situations in which the cleanup criteria may result in population does well below this limit. Regardless of the levels chosen, the committee felt that there was a need to have public input and discussion and, ultimately, "buy-in" into whatever levels were chosen. The public must understand the potential risks associated with certain levels of exposure and/or residual contamination, the time and effort required to achieve a particular level of

decontamination, and the overall impact on the locality and the cost of these activities. If the cleanup level is higher than the recommended limits, the affected and informed members of the public must choose freely to accept the additional risk.

f. Research and development needs

The discussion of research and development needs included a number of areas. Research and development in radioprotection and biodosimetry included such items as the development of pharmacological strategies and the use of nutritional agents in the population as a follow-up to such an incident. In addition, there was a need to better assess the radiation exposures of the first-responders and the general public exposed in such an incident. In this regard, there was a need to establish mechanisms for long-term medical follow-up of the population and for better screening test for cancer.

Instrumentation and dosimetry represent another area in there were a number of needs. These include the development of appropriate and affordable radiation detection equipment (especially high range and high-dose rate instruments). Simple, rugged personnel monitoring devices are needed for the thousands of emergency respond personnel across the country with a potential to respond to such an event. In terms of long-term planning and cleanup, there is a need to design expedient survey methods.

Finally, the committee concluded that the psychosocial aspects of such incidents required a great deal of research. There was a need for a systematic analysis of radiological incidents, a study of the psychological aspects of decontamination and the post-incident “radiation stigma,” and a

better understanding of high-risk and sensitive groups in the population. In addition, the committee concluded that, "There is a clear lack of appropriate training for dealing with the social and psychological consequences of incidents involving WMD."

Summary

The NCRP Scientific Committee was formed and was working prior to the events of September 11th. A final draft of the report had been delivered to the DOE to meet the conditions of the contract on September 1, 2000. One of the charges of the committee was to provide guidance as to necessary research and make recommendations regarding the present infrastructure with the responsibility for responding to such incidents. Important issues included recognition of the event, the interface between federal, state, and local authorities, exposure limits for the first-responders, clean-up criteria, training and resources, the psychosocial aspects of such events, and communications with the media and the public. This report represents the "beginning" of such considerations. It points the way for additional studies and research in this very important area.

Acknowledgments

The authors would like to express their appreciation for the efforts of all members of NCRP Scientific Committee 46-14. The open discussions and wide-spread cooperation made this effort enjoyable. In addition, we gratefully acknowledge the contributions of Dr. Eric E. Kearsley and Ms. Cindy L. O'Brien of the NCRP Secretariat.

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National Council on Radiation Protection and Measurements. Management of terrorist events involving radioactive material, Bethesda, MD: NCRP; NCRP Report No. 138; October 24, 2001.

Table 1. Members of NCRP Scientific Committee 46-14

Name	Agency or Organization	Area of Expertise
C. Abdelnour,	Defense Threat Reduction Agency	Communications, public information
E. J. Ainsworth	Armed Forces Radiobiology Inst. (ret.)	Radio-bioeffects, medical aspects
R. L. Brittigan	Defense Threat Reduction Agency	Federal system, legal aspects
S. M. Becker	University of Alabama-Birmingham	Psychosocial issues
I. S. Hamilton	Texas A&M University	Health physics, radiation dosimetry
E. E. Hickey	Battelle, Pacific Northwest National Laboratories	Health physics, emergency planning and response
D. A. Kelm	Illinois Dept. of Nuclear Safety	State emergency response planning
F. A. Mettler, Jr.	University of New Mexico, School of Medicine	Medical aspects, radio-bioeffects
J. W. Poston, Sr.*	Texas A&M University	Health physics, internal and external dosimetry
J. M. Thompson	Westinghouse Safety Management Solutions, Inc.	Health physics, emergency planning and response
M. C. Wrobel	U.S. Air Force	Health physics, response to WMD
E. E. Kearsley	Armed Forces Radiobiology Inst. (ret.)	Health physics, NCRP Staff

* Committee chair